Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

Canadian Intellectual Property Office
An agency of Industry Canada

CA 2350437 A1 2000/05/18

(21) 2 350 437

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 1999/10/26
(87) Date publication PCT/PCT Publication Date: 2000/05/18
(85) Entrée phase nationale/National Entry: 2001/05/10
(86) N° demande PCT/PCT Application No.: CH 99/00506
(87) N° publication PCT/PCT Publication No.: WO 00/27489
(30) Priorité/Priority: 1998/11/11 (2257/98) CH

(51) Cl.Int.^{7}/Int.Cl.^{7} A63C 17/00

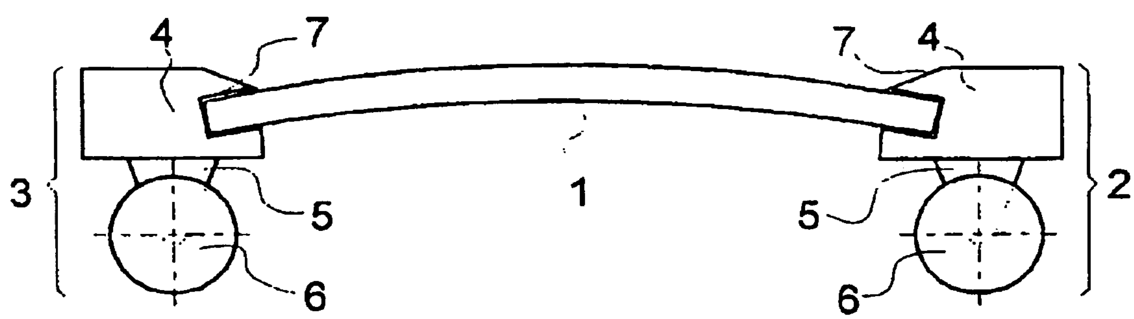
(71) Demandeur/Applicant:
MICRO MOBILITY SYSTEMS AG, CH

(72) Inventeur/Inventor:
OUBOTER, WIM A., CH

(74) Agent: GOWLING LAFLEUR HENDERSON LLP

(54) Titre : DISPOSITIF A DEPLACEMENT TEL QU'UNE PLANCHE A ROULETTES OU DES PATINS A ROULETTES ET EQUIVALENT

(54) Title: TRAVEL DEVICE SUCH AS A SKATEBOARD OR A SCOOTER AND SIMILAR



(57) Abrégé/Abstract:

The invention relates to a travel device, such as a skateboard or a scooter and similar, comprising two running gears (2, 3), each of which has at least one wheel (6), and at least one of said running gears (2, 3) being steerable. According to the invention, a foot-board (1) is provided, connecting the two running gears (2, 3). Said foot-board is elastically deformable and has a spring rate in the range of 0.03 to 0.25 mm/kg. The foot-board (1) is detachably connected to the running gears (2, 3). Several foot-boards (1) with different, progressive spring rates are provided so that the travel device can be adapted to the different requirements of different users. The individual foot boards (1) are characterised by different dimensions and/or different materials. Reinforcement struts can also be introduced into the foot board (1). Running gears (2, 3) with different constructions and functioning modes can be combined with foot boards (1) of this type. The invention therefore provides a means of adapting a travel device to the user's requirements in terms of the quality of movement, especially the spring system.

Scooter

The present invention relates to a scooter according to the generic clause of claim 1.

Such travel devices are preferably used by children and young persons, on the one hand as a means of locomotion and, on the other hand, as a sports requisite or simply as a pastime and for pleasure. Scooters are primarily regarded as a toy device for small children, but scooters have also become known which are intended for adults as a means of locomotion in the downtown areas of big cities.

A travel device of the type mentioned in the generic clause of claim 1 is known from WO95/34461. The collapsible scooter has a rigid footboard. According to a special embodiment, a central part of the footboard extends on a lower level than the ends of the footboard.

US-A-4,179,133 discloses a means with the aid of which a roller board can be converted into a scooter.

Scooters are predominantly used on sidewalks. The surface of such areas serving as a track are normally of a firm nature, e.g. tarred or paved, sometimes they are, however, also covered with slabs. Quite large surface irregularities are not uncommon. Since the travel devices of the above-mentioned kind have unsprung wheels, the bumps produced when the travel device is moving are felt to be very unpleasant by the users of such travel devices. The handling properties of scooters differ depending on the respective structural design of these travel devices.

DE-A-2820934 discloses a skateboard provided with a brake mechanism. The braking means prevents the skateboard from rolling in the unloaded condition. When the middle of the skateboard has a load applied thereto, the brake will be released due to a deformation of the footboard of the skateboard. By purposefully applying a stronger load to the flexible and springy footboard when the skateboard is moving, a purposeful braking effect can be achieved.

SUBSTITUTE SHEET

WO 98/46474 discloses a collapsible treadle scooter comprising essentially a front running gear carrier which supports a single wheel and which has foldably connected thereto a steering handle, a footboard and a rear-wheel axle with two wheels, said rear-wheel axle being secured below the footboard. According to a preferred embodiment, the footboard may consist of a front and a rear part, the two parts being interconnected via a joint. The joint may consist of a shock-absorbing material. Part of the footboard can be implemented such that it is elastic.

It is the object of the present invention to provide a scooter having improved handling properties.

This object is achieved by the subject matter of claim 1. Preferred further developments of the present invention represent the subject matters of the subclaims.

In the following, one embodiment of the present invention will be explained in detail making reference to the drawing, in which:

Fig. 1 shows a diagram of a roller board,

Fig. 2 shows a section through a footboard,

Fig. 3 shows a single running gear,

Fig. 4 shows a top view of a further embodiment of a running gear,

Fig. 5 shows the same embodiment in a schematic side view,

Fig. 6 shows a diagram of a modified running gear during straight-on travelling.

Fig. 7 shows a diagram of this running gear during cornering and

Fig. 8 shows a section through a damper.

In Fig. 1 reference numeral 1 stands for a footboard connected to a front running gear 2 on one side and to a rear running gear 3 on the other side thereof. In the example shown, the two running gears 2 and 3 are identical. Each of the running gears 2 and 3 consists of a support 4, a wheel holder 5 connected thereto and at least one wheel 6 which is rotatably supported in said wheel holder 5. The wheels 6 may, for example, be rollers having the shape of a cylinder of the type normally used in the case of roller boards according to the prior art. In such a case, the wheel holder 5 accommodates two wheels 6 which are rotatable about a common axis.

According to the present invention, the footboard 1 is releasably connected to the running gears 2, 3. It is therefore possible to replace one of the running gears 2, 3 by another one having a different structural design or to replace both running gears 2, 3 by running gears

having a different structural design. It is, for example, possible to use a front running gear 2 in the case of which the axle about which the wheels 6 rotate is pivotable, whereas a running gear having a different structural design, viz. e.g. a fixed axle, is used as a rear running gear 3.

According to the present invention, the footboard 1 is, in addition, constructed such that it will resiliently yield under load, said load being caused by the user's weight which acts on the footboard 1 when such a roller board is in use. When, as is normally the case, the footboard 1 is acted upon by the weight of a person approximately in the middle thereof, the elastic deflection will advantageously be approx. 2 to 3 cm. In this it is way achieved that bumps caused by ground-surface irregularities will be compensated for comparatively smoothly by elastic deflection so that these bumps will act on the user in a very mild form. This will create a pleasant feeling when the travel device is moving.

By means of the present invention it is achieved that such a travel device can easily be adapted to the user's needs. It is, for example, possible to replace a footboard 1 by another footboard 1. A first structural design of a footboard 1 has dimensions which are adapted e.g. to the measurements and the weight of an adult, whereas a second structural design of a footboard 1 is adapted to the measurements and the weight of a child. The adaptation to different measurements and different weights is, on the one hand, effected by varying the dimensions of the footboard 1, viz. the length, the width and the thickness. Each of these three dimensions also influences the elastic deflection. A further variation possibility is the use of different materials for the footboard 1. For example, both plastic material and multi-layered, glued wood are adapted to be used as a material for the footboard. For the elastic deflection as a function of weight also the modulus of elasticity of the material is of essential importance.

The dimensions of variants of the footboard 1 should be chosen depending on the requirements to be satisfied. The length ranges between 50 and 80 cm, the width ranges between 12 and 18 cm, whereas the thickness may range between 8 and 25 mm, the thickness depending primarily on the material used and on the modulus of elasticity of said material.

It will be particularly advantageous when the material used for the footboard 1 is a multi-layered, glued wood which is known under the designation plywood. This material is char-

acterized in that, on the one hand, it is able to resist comparatively high loads and that, on the other hand, it has remarkable vibration damping properties. This has the effect that such a footboard 1 acts a shock absorber.

Also plastic materials have good damping properties. According to an advantageous embodiment, the footboard 1 may therefore also consist of plastic material. When a material belonging to this group of materials is used, the footboard 1 can be implemented as a box.

It will be of advantage when the material and the dimensions of the footboard 1 are chosen such that a spring rate of e.g. 0.1 mm/kg is obtained. When the footboard 1 has applied thereto a load of 30 kg approximately in the middle thereof, the elastic deflection will be 3 mm. It is, however, also possible to realize "harder" footboards 1 having a spring rate of e.g. 0.03 mm/kg or "softer" footboards 1 having a spring rate of e.g. 0.25 mm/kg. If the footboard 1 is implemented as a box, as has been mentioned hereinbefore, it will be possible to insert reinforcement struts into individual cavities according to an advantageous embodiment. With the aid of such reinforcement struts , the spring rate can be changed subsequently so as to adapt it to the user's wishes. Such a variability of the spring rate can be realized also in the case of other embodiments; in a footboard 1 made of plywood, which is shown in Fig. 2, the spring rate can be varied e.g. by providing both longitudinal sides of the footboard with grooves N which are adapted to have reinforcement struts S inserted therein. The variation of the spring rate by introducing reinforcement struts S has the advantage that it is not necessary to provide a plurality of different footboards 1. This will reduce the variety of variants. without any necessity of giving up the advantage of different spring rates.

The running gears 2, 3 have a slot 7 into which the footboard 1 can be inserted so that said running gears 2, 3 can be connected to the footboard 1 in a simple manner. The connection between the running gears 2, 3 and the footboard 1 is fixed e.g. by means of screws which are not shown in the figure 1.

In Fig. 3 a single running gear 2 is shown. It consists analogously of a support 4 having a slot 7 for inserting a footboard 1 which is not shown in this figure. The fastening means, e.g. screws, are not shown either. Other than in the case of the example according to Fig. 1, the wheel 6 is here not arranged below the support 4, but it is arranged in a mode of arrangement that is normally used in the case of scooters. viz. in such a way that a rear part of the support 4 is implemented as a fork 8 in which an axle 9, about which the wheel 6 rotates, is secured in position. In this case, the wheel 6 does not have the shape of a cylinder after the fashion of skateboards, but it will be of advantage when said wheel has a structural design of the type used for the wheels of inline skates.

Fig. 4 shows a further embodiment of a running gear 2. This is a steerable running gear 2 with two wheels, which, due to its steerability, is particularly suitable for use as a front running gear.

Fig. 4 shows, outlined by broken lines, a part of the footboard 1 which is fixed in the slot 7 of the support 4 by two screws 10. At the front end 11 of the support 4 located opposite the slot 7, two hinges are provided, viz. a left support hinge 12 and a right support hinge 13. A left journal 14 is pivotable about said left support hinge 12 and a right journal 15 is pivotable about said right support hinge 13 in a corresponding manner. The possible pivotal movement about the support hinges 12, 13 is marked with arrows. The ends of the two journals 14, 15 located opposite the support hinges 12 and 13 are provided with hinges 16 through which these ends are connected to a track rod 17. It follows that the connecting line between the two support hinges 12, 13 together with the two journals 14, 15 and the track rod 17 define a parallelogram. By means of said track rod 17 it is achieved that the two journals 14, 15 are coupled to one another so that they can only be pivoted simultaneously. The left journal 14 has rigidly secured thereto a left wheel axle 18 about the other end of which a left front wheel 19 is freely rotatable, e.g. by means of a ball bearing which is not shown. In the same way, the right journal 15 has secured thereto a right wheel axle 20 about the other end of which a right front wheel 21 is freely rotatable, i.e. each of said front wheels 19, 21 has a separate wheel axle 18, 20 so that an independent wheel suspension is obtained.

The pivotal movement of the two journals 14, 15 has the effect that the wheel axles 18, 20, which are rigidly connected to said journals 14, 15 , are pivoted through the same angle as the journals 14, 15 . Also the front wheels 19, 21 are pivoted correspondingly. In the representation according to Fig. 4, the two front wheels 19, 21 are positioned parallel to the longitudinal axis of the whole travel device, a position which results in straight-on travelling. If one of the two journals 14, 15 is deflected clockwise e.g. by 15° in comparison with the

position shown in the drawing - due to the coupling rod 17, this will have the effect that also the other journal 15, 14 is deflected in the same way - the front wheels 19, 21 will assume a position at which they are inclined at an oblique angle to the right in such a way that they are also deflected by 15° relative to the longitudinal axis of the travel device. The travel device would then take a curve to the right.

Steering of such a construction can be performed in different ways. For example, the track rod 17 may have secured thereto a driving pin 22 that is movable by means of a steering handle, which is not shown, in the directions designated with broken-line arrows.

In the following an embodiment is described in the case of which a steering handle can be dispensed with. The fundamental arrangement corresponds to that which has just been described. The essential aspect, however, is that the axes of the support hinges 12, 13 and of the hinges 16 are markedly inclined relative to the vertical, as can clearly be seen in Fig. 4 which shows a side view from the right, the components shown in Fig. 4 being provided with the same reference numerals.

The right front wheel 21, which is in principle visible in this side view, is here only shown in the form of its contour line so that the view of the parts located behind said front wheel is not obstructed. Behind this front wheel 21 the right journal 15 can be seen. This journal 15 has rigidly secured thereto the right wheel axle 20. In this view, said right wheel axle 20 extends at right angles to the plane of projection, i.e. only the diameter thereof is visible. As far as the right support hinge 13 (Fig. 4) is concerned, which is not visible in Fig. 5, only the axis of rotation A_{13} of said support hinge is shown here. The axis of rotation A_{12} of the left support hinge 12 (Fig. 4) is located behind A_{13}, i.e. it is not visible either. The axis of the hinges 16 is designated by A_{16}. The angle between the two axes of rotation A_{12}, A_{13} of the support hinges 12, 13 and the vertical is preferably approx. 20 to 60°; a value of 47° proved to be the optimum value. It follows that the axes of rotation A_{12}, A_{13} of the support hinges 12, 13 are inclined at an oblique angle in such a way that, on the one hand, they extend parallel to an ideal surface which extends at right angles to a centre line M (Fig. 4) of the footboard 1 and of the whole travel device, respectively, and that, on the other hand, they extend from the front top to the rear bottom. The axes of rotation A_{16} of the of the hinges 16 are inclined in the same way, the track rod 17 rotating about said hinges 16 relative to the two journals 14, 15, when said journals 14, 15 rotate about the support hinges 12, 13 in the direction marked by arrows in Fig. 3.

The marked inclination of the axes of rotation A_{12}, A_{13}, A_{16} of the above-mentioned parallelogram consisting of the connecting line of the support hinges 12, 13, the journals 14, 15 and the track rod 17 has the effect that the wheel axles 18, 20 secured to the journals 14, 15 will extend horizontally only if the journals 14, 15 define an angle of precisely 90° relative to the connecting line of the support hinges 12, 13 in accordance with the representation shown in Fig. 4. At this position the wheel axles 18, 20 additionally extend at an angle of precisely 90° relative to the centre line M of the footboard 1 and of the whole travel device, respectively; hence, the front wheels 19, 21 will, in turn, extend parallel to this centre line. This corresponds to straight-on travelling of the travel device.

By means of the above-mentioned embodiment it is achieved that the wheel axles 18, 20 and the journals 14, 15 are pivoted away from the position of straight-on travelling as soon as the footboard 1 has applied thereto a heavier load on one side thereof; in the present context, on one side means that the ideal load application point is located on the right- or on the left-hand side of the imaginary centre line M.

Let us assume that the ideal load application point on the footboard 1 is located on the right-hand side of the centre line M, as shown in Fig. 4. The ideal load application point is designated by reference symbol L. This load application has automatically the effect that the right front wheel 21 has applied thereto a heavier load than the left front wheel 19. This also has the effect that the front wheel 21 applies a perpendicularly effective force to the right front axle 20 which, in turn, applies a force to the right journal 15. In view of the fact that the respective counterforces acting on the left front wheel 19, the left front axle 18 and the left journal 14 decrease at the same time, the journals 14, 15 will – because of the oblique position of the axes of rotation A12, A13 of the support hinges 12, 13 – be rotated clockwise to a certain extent about the axes of rotation A12, A13 of the support hinges 12, 13, the track rod 17 will be displaced correspondingly and the front axles 18, 20 with the front wheels 19, 21 connected thereto as well as the journals 14, 15 will move correspondingly. Such a position is shown in Fig. 4 by a dotted line. The right front axle 20 now extends rearwards at a slightly oblique angle, and simultaneously it also extends upwards at a slightly oblique angle. In addition, the left front axle 18 extends forwards at a slightly oblique angle, and simultaneously is also extends downwards at a slightly oblique angle. Accordingly, the front wheels 19. 21 assume a slightly oblique position with regard to both axles; for the sake of clarity, this is, however, not shown in Fig. 4 with respect to the upward and downward inclination. It follows that, in relation to the footboard 1,

SUBSTITUTE SHEET

the right front wheel 21 is positioned on a slightly higher level and the left front wheel 19 on a slightly lower level. When the two front wheels 19, 21 are placed on a flat ground surface, the footboard 1 will therefore be inclined about the centre line M_1 in such a way that its right edge is located slightly closer to the ground surface, whereas the distance between the left edge and the ground surface is slightly larger. In view of the fact that the front wheels 19, 21 assume a slightly oblique position in the case of this steering construction, it will be of advantage when they do not have a cylindrical tread, but also these front wheels should have a structural design of the type used for inline skates.

Hence, the user of the travel device can control the direction of movement simply by shifting his weight. A steering handle is not necessary. This shifting of weight can take place in different ways. The user may, for example, place one foot on the footboard 1 at a laterally displaced position, but he may also incline his body.

In the case of a travel device having this type of structural design, it may be of advantage when straight-on travelling is stabilized by special measures. Fig. 6 and 7 schematically show an embodiment which corresponds to the above-mentioned running gear to a very large extent. Also in the case of this running gear, journals 14, 15 are provided, which are adapted to be rotated about support hinges 12, 13 on the one hand, and which are connected to a track rod 17 on the other hand, said track rod 17 being connected to the journals 14, 15 by means of hinges 16. This track rod 17 is adapted to be displaced in the direction marked by an arrow. In the case of this running gear variant, a resetting device is provided, which is provided with a stop 30 that is fixedly secured to the front end 11 of the support 4. The track rod 17 has secured thereto a holder 31 close to each of the two ends thereof. Two dampers 32 are arranged on the track rod 17 such that they are displaceable thereon, one of said dampers 32 being located on one side of the stop 30, whereas the other damper 32 is arranged on the other side of said stop 30. Each damper 32 comprises a first perforated disc 33 and a second perforated disc 34 as well as a ring 35 which is arranged between said perforated discs 33, 34. The internal diameters of said perforated discs 33, 34 are larger than the diameter of the track rod 17 so that said perforated discs

are freely movable relative to said track rod 17. The ring 35 is, however, dimensioned such that its interior diameter is slightly smaller than the diameter of the track rod 17. Hence, said ring 35 produces a sliding friction on the track rod 17.

Compression springs 36 are arranged between the dampers 32 and the holders 31. It will be advantageous to pretension the compression springs 36 between the damper 32 and the holder 31. By means of this pretension, the stop 30 will be caused to remain at a central position corresponding to straight-on travelling without the influence of any other force, as can be seen from Fig. 6. If the user of the travel device shifts his weight on the footboard 1, the pretension of one of the compression springs 36 first has to be overcome before a deflection of the wheels can occur. Fig. 7 shows this arrangement in a condition of strong deflection of the wheels. One of the compression springs 36 is here under no stress at all, whereas the other compression spring 36 is strongly compressed. By means of this arrangement it is achieved that the user must shift his weight against one of the compression springs 36. As has turned out in tests, this will specially improve the sensitive steerability of the travel device.

It will be particularly advantageous when the friction produced by the dampers 32 is variable. This is achieved in an advantageous manner in that the diameter of the track rod 17 is not constant over the whole length, but that the track rod 17 has the largest diameter in the middle, whereas the diameter decreases towards the two ends thereof. When the running gear occupies the straight-on travelling position, which is shown in Fig. 6, the rings 35 will be expanded more strongly by the larger diameter which the track rod 17 has in the central area thereof, and this will result in strong friction. When the wheels of the running gear are, however, deflected to a higher degree, as can be seen in Fig. 7, one of the rings 35 of one of the dampers 32 will longitudinally be displaced by the stop 30 relative to the track rod 17 to such an extent that this ring 35 will occupy a position at which the diameter of the track rod 17 is smaller. The sliding friction will be correspondingly lower. Also this measure serves to improve the steerability by the user.

The ring 35 should advantageously consist of a rubber-elastic material. The perforated discs 33, 34 should advantageously consist of plastic material; this has the advantage that irritating noise will be avoided when the dampers 32 come into contact with the stop 30.

It will be advantageous when the damping effect that can be produced by the sliding friction is variable. This can be achieved in a particularly simple manner by an embodiment shown in Fig. 8. Fig. 8 shows a section through a damper 32 which is displaceable on the track rod 17. The section has been made through the ring 35. The ring 35 is encompassed by a shackle 38. This shackle 38 is, in the manner known, provided with an adjusting screw 39 by means of which the shackle 38 can be fastened more or less tightly. When the shackle 38 is tightened only slightly, the ring 35 will be compressed only slightly. Hence, the friction of said ring on the track rod 17 will not be high. When the shackle 38 is fastened more tightly, the ring 35 will be compressed more strongly so that the friction will be increased. In this way, it is achieved in an advantageous manner that straight-on travelling will be stabilized to a higher degree at higher speeds and in the case of uneven ground surfaces.

The above-mentioned solution making use of the shackle 38 is to be regarded as only one possible embodiment. Other solutions producing the same effect, e.g. after the fashion of a stuffing box having a variable pretension, are equivalent to this embodiment.

Footboards 1 having various structural designs can be combined with different running gears 2, 3 within the framework of the present invention. Hence, the travel device can be given completely different handling properties depending on the footboard 1 and the running gears 2, 3 used.

Claims

1. A scooter comprising two running gears (2, 3), each of which has at least one wheel (5, 6) and at least one of which is implemented such that it is steerable, and further comprising a footboard (1) connecting the two running gears,
characterized in that
   - the front and the rear running gear (2, 3) each include an arèa which overlaps the front footboard area and the rear footboard area, respectively, and that the footboard is secured to the running gears with the aid of releasable fastening means, such as screws, so that a releasable connection is established which permits the footboard to be exchanged.
   - the at least one wheel of the front running gear (2) and the at least one wheel of the rear running gear (3) are respectively arranged in front of and behind the footboard and consequently not below the surface defined by the footboard,
   - the footboard (1) is elastically deformable and acts as a shock absorber,
   - the footboard is convex in shape so that, when no load is applied thereto, the distance between the middle of said footboard and the track will be larger than the distance between the ends of said footboard and the track, said footboard ends being connected to the running gears (2, 3).

2. A scooter according to claim 1,
characterized in that,
when a load is applied to the middle of the footboard, a spring deflection of 0.1 mm/kg will take place.

3. A scooter according to claim 1,
characterized in that,
when a load is applied to the middle of the footboard, a spring deflection of 0.03 to 0.25 mm/kg takes place.

4. A scooter according to one of the preceding claims,
characterized in that the footboard (1) consists of multi-layered, glued wood.

SUBSTITUTE SHEET

5. A scooter according to one of the preceding claims, **characterized in that** reinforcement struts are adapted to be inserted in the footboard (1).

6. A scooter according to one of the preceding claims, **characterized in that** the front running gear carries two parallel wheels.

7. A scooter according to one of the preceding claims, **characterized in that** the rear running gear is provided with a fork (8) in which an axle (9), about which an individual wheel (6) rotates, is secured in position.

8. A scooter according to one of the preceding claims, **characterized in that,** on the level on which the footboard (1) is secured to the running gear by means of screws, the width of the footboard (1) substantially corresponds to the width of the contact surface of the running gear.

Fig. 1

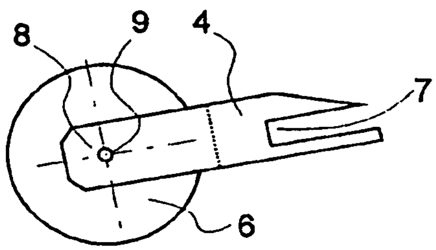


Fig. 3

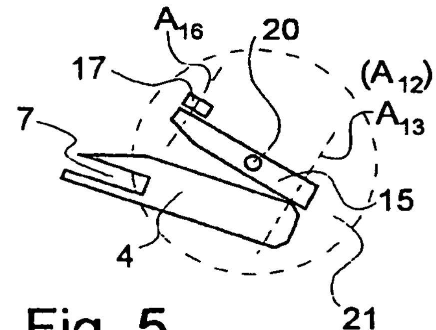


Fig. 5

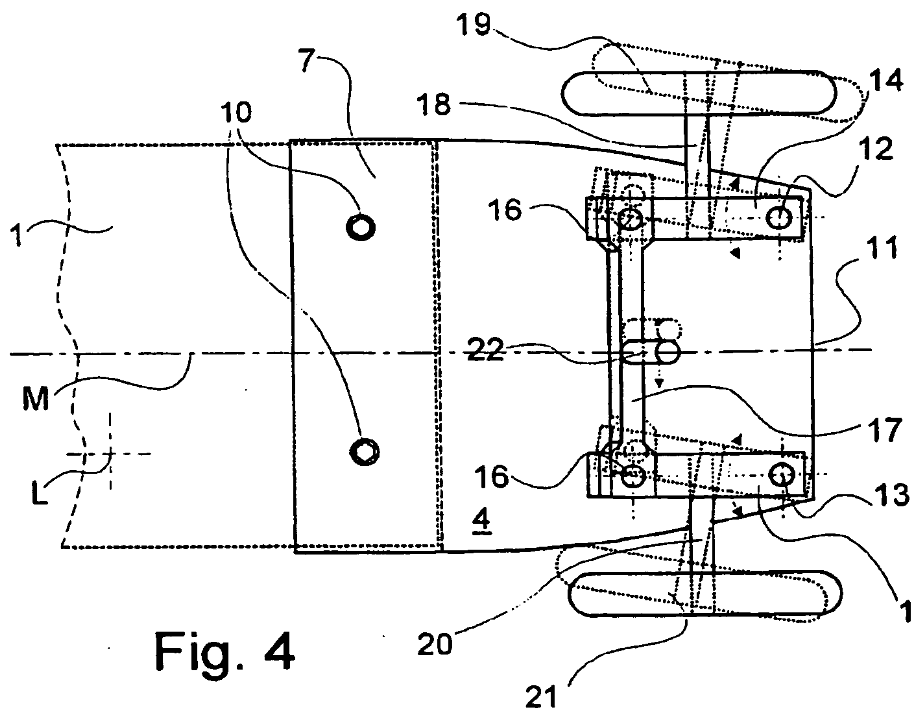


Fig. 4

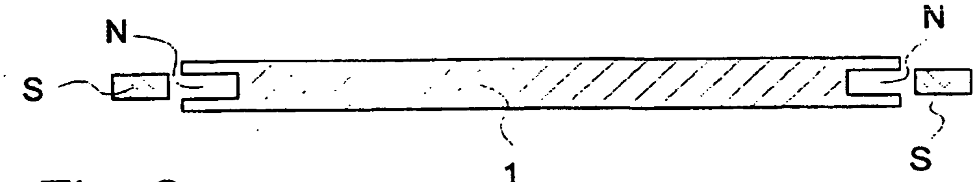


Fig. 2

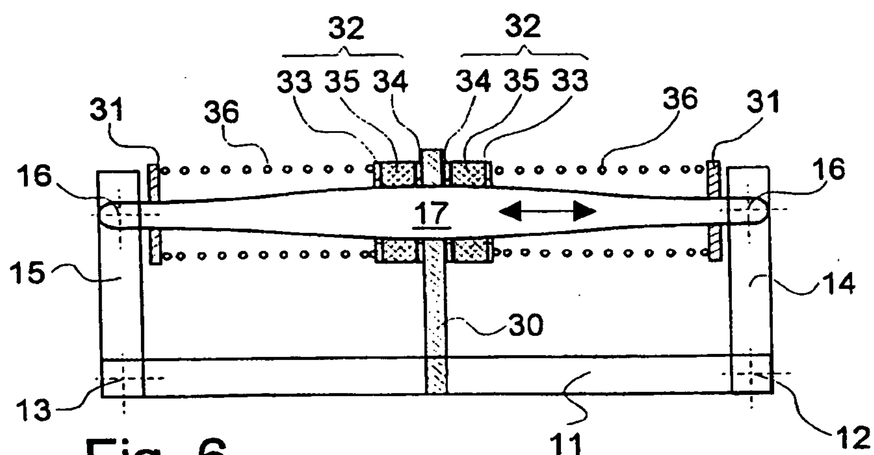


Fig. 6

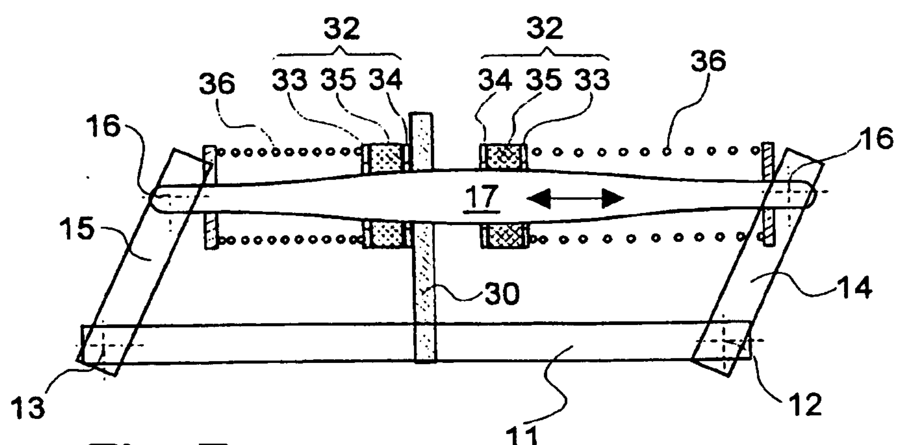


Fig. 7

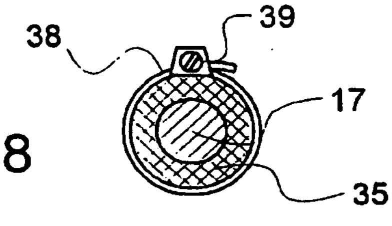


Fig. 8